

1 2 3 4 5 6 7 8 9 10 11 12 13



FIGURE 1

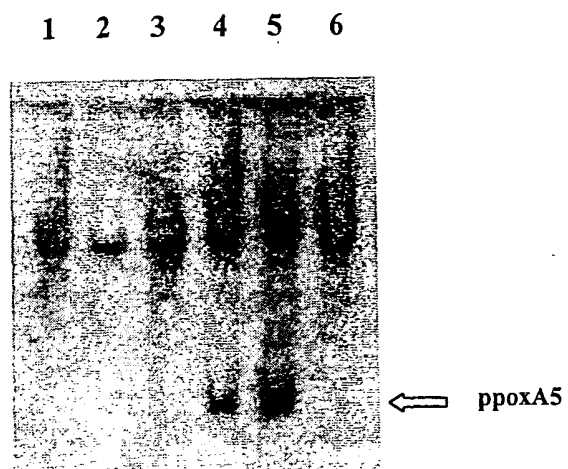


FIGURE 2

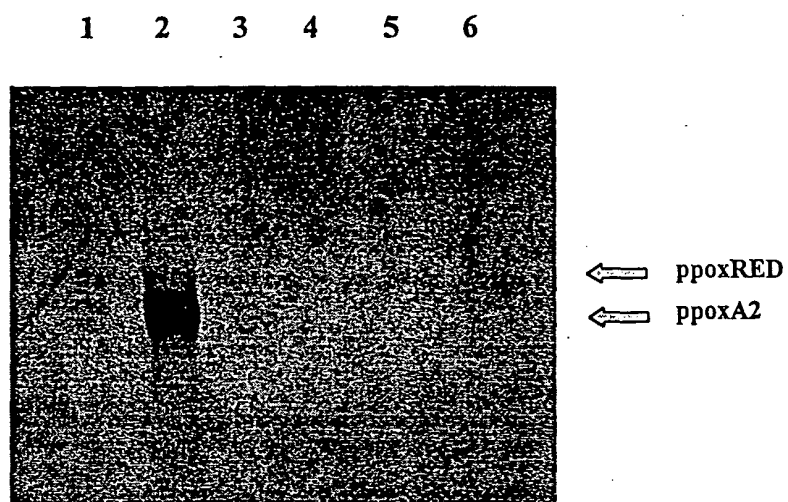


FIGURE 3

FIGURE 4

ppox-CYP52A2A

Sequence Range: 1 to 2631
POX4 promoter sequence underlined

<u>TATTTCCGGAGAAATATCGTTGGGGTAAACAACAGAGAGAGAGAGGGAGAGATGGTTCTGGTAGAATTATAATCTGGTT</u>	80
<u>GTTGCAAATGCTACTGATCGACTCTGGCAATGTCTGTAGCTCGCTAGTTGTATGCAACTTAGGTGTTATGCATACACAG</u>	160
<u>GTTATTCGGTTGAATTGTGGAGTAAAAATTGTCTGAGTTGTGTCTTAGCTACTGGCTGGCCCCCGCGAAAGATAATCAA</u>	240
<u>AATTACACTTGTGAATTTTGCACACACACCGATTAAACATTTCCCTTTTTTGTCCACCGATACACGCTTGCCTCTTCTTT</u>	320
<u>TTTTTCTCTGTGCTTCCCCCTCTGTGACTTTTTCCACCATTGATATAAAATCAACTCCATTTCCCTAAAATCTCCCCAG</u>	400
<u>ATTCTAAAAACAATTCTTCTCTTCTGCTTTTCCCTTTTTTTTGTATATTTATTTACCATCCCTTTTTTTTGAATAGTT</u>	480
<u>ATTCCCCACTAACATTGTTCAAATCTTCACGACATAATGACTGTACACGATATTATCGCCACATACTTCACCAAATGGTA</u>	560
CGTGATAGTACCACTCGCTTGATTGCTTATAGAGTCTCTGACTACTTCTATGGCAGATACTTGATGTACAAGCTTGGTG	640
CTAAACCATTTTTCCAGAAACAGACAGACGGCTGTTTCGGATTCAAAGCTCCGCTTGAATTGTTGAAGAAGAAGAGCGAC	720
GGTACCCTCATAGACTTCACACTCCAGCGTATCCACGATCTCGATCGTCCCGATATCCCACTTTCACATTCCCGGTCTT	800
TTCCATCAACCTTGTCAATACCCTTGAGCCGGAGAACATCAAGGCCATCTTGGCCACTCAGTTCAACGATTTCTCCTTGG	880
GTACCAGACACTCGCACTTTGCTCCTTTGTTGGGTGATGGTATCTTTACGTTGGATGGCGCCGGCTGGAAGCACAGCAGA	960
TCTATGTTGAGACCACAGTTTGCCAGAGAACAGATTTCCACGTCAGTTGTTGGAGCCACACGTTTCAAGTGTCTTCAA	1040
ACACGTCAGAAAGGCACAGGGCAAGACTTTTGACATCCAGGAATTGTTTTTCAGATTGACCGTCGACTCCGCCACCGAGT	1120
TTTTGTTTGGTGAATCCGTGAGTCCCTTGAGAGATGAATCTATCGGCATGTCCATCAATGCGCTTGACTTTGACGGCAAG	1200
GCTGGCTTTGCTGATGCTTTTAACTATTTCGAGAAATTATTTGGCTTCGAGAGCGGTTATGCAACAATTGTACTGGGTGTT	1280
GAACGGGAAAAAGTTTAAGGAGTGCAACGCTAAAGTGACAAAGTTTGCTGACTACTACGTCAACAAGGCTTTGGACTTGA	1360
CGCTGAACAATTGGAAGAGCAGGATGGTTATGTGTTTTTGTACGAATTGCTCAAGCAAACAGAGACAAGCAAGTGTG	1440
AGAGACCAATTGTTGAACATCATGGTTGCTGGTAGAGACACCACCGCGGTTTGTGTCGTTTGTCTTTTGAATTGGC	1520
CAGAAACCCAGAAGTTACCAACAAGTTGAGAGAAGAAATTGAGGACAAGTTTGGACTCGGTGAGAATGCTAGTGTGAAG	1600
ACATTTCTTTGAGTCTGTAAGTCTGTGAATACTTGAAGGCTGTTCTCAACGAAACCTTGAGATTGTACCCATCCGTG	1680
CCACAGAATTTGAGAGTTGCCACCAAGAACTACCTCCCAAGAGGTGGTGGTAAGGACGGGTGTCTCCTGTTTTGGT	1760
GAGAAAGGGTCAGACCGTTATTTACGGTGTCTACGCAGCCACAGAAACCCAGCTGTTTACGGTAAGGACGCTCTTGAGT	1840
TTAGACCAGAGAGATGGTTGAGCCAGAGACAAAGAAGCTTGGCTGGGCCTTCTCCCATTCACGGTGGTCCAAGAATC	1920
TGTTTGGGACAGCAGTTTGCCTTGACAGAAGCTTCGTATGTCACTGTGAGTTGCTCCAGGAGTTTGACACTTGTCTAT	2000

FIGURE 4 (CONT'D)

GGACCCAGACACCGAATATCCACCTAAGAAAATGTCGCATTGACCATGTCGCTTTTCGACGGTGCCAATATTGAGATGT 2080
ATTAGAGGGTCATGTGTTATTTTGATTGTTTAGTTTGTAACTACTGATTAGGTTAATTCATGGATTGTTATTTATTGATA 2160
GGGGTTTGCGCGTGTTCATTCACTTGGGATCGTTCCAGGTTGATGTTTCCTTCCATCCTGTCGAGTCAAAAGGAGTTT 2240
GTTTTGTAACTCCGGACGATGTTTTAAATAGAAGGTCGATCTCCATGTGATTGTTTTGACTGTTACTGTGATTATGTAAT 2320
CTGCGGACGTTATACAAGCATGTGATTGTGGTTTTGCAGCCTTTTGACGACAAATGATCGTCAGACGATTACGTAATCT 2400
TTGTTAGAGGGTAAAAAAAACAAAATGGCAGCCAGAATTTCAAACATTCTGCAAACAATGCAAAAATGGGAAACTCC 2480
AACAGACAAAAAAAACCTCCGCAGCACTCCGAACCCACAGAACAATGGGGCGCCAGAATTATTGACTATTGTGACTTT 2560
TTTACGCTAACGCTCATTGCAGTGTAGTGCGTCTTACACGGGTATTGCTTTCTACAATGCAAGGGCACAG 2630

FIGURE 5

ppox-CYP52A5A

Sequence Range: 1 to 2652

POX4 promoter sequence underlined

<u>TATTTCGGGAGAAATATCGTTGGGGTAAACAACAGAGAGAGAGAGGGGAGAGATGGTTCGGTAGAATTATAATCTGGTT</u>	80
<u>GTTGCAAATGCTACTGATCGACTCTGGCAATGTCTGTAGCTCGCTAGTTGTATGCAACTTAGGTGTTATGCATACACAG</u>	160
<u>GTTATTGGTTGAATTGTGGAGTAAAAATTGTCTGAGTTGTGTCTTAGCTACTGGCTGGCCCCCGCGAAAGATAATCAA</u>	240
<u>AATTACACTTGTGAATTTTGCACACACACCGATTACATTTCCCTTTTTTGTCCACCGATACACGCTGCCTCTTCTTT</u>	320
<u>TTTTTCTCTGTGCTTCCCCCTCCTGTGACTTTTTCCACCATTGATATAAAATCAACTCCATTTCCCTAAAATCTCCCCAG</u>	400
<u>ATTCTAAAAACAATTCTTCTCTTCTGCTTTTCTTTTTTTTGTATATTATTACCATCCCTTTTTTTGAATAGTT</u>	480
<u>ATTCCCCACTAACATTGTTCAAATCTTCACGACATAATGATTGAACAACTCCTAGAATATTGGTATGTCGTTGTGCCAGT</u>	560
GTTGTACATCATCAACAACCTCCTTGATACACAAGACTCGCGTCTTGATGAAAAGTTGGGTGCTGCTCCAGTCACAA	640
ACAAGTTGTACGACAACGCTTTCGGTATCGTCAATGGATGGAAGGCTCTCCAGTTCAAGAAAGAGGGCAGGGCTCAAGAG	720
TACAACGATTACAAGTTTGACCACTCCAAGAACCCAGCGTGGGCACCTACGTCAGTATTCTTTTCGGCACCAGGATCGT	800
CGTGACCAAAGATCCAGAGAATATCAAAGCTATTTTGGCAACCCAGTTTGGTGATTTTCTTTGGGCAAGAGGCACACTC	880
TTTTTAAGCCTTTGTTAGGTGATGGGATCTTCACATTGGACGGCGAAGGCTGGAAGCACAGCAGAGCCATGTTGAGACCA	960
CAGTTTGCCAGAGAACAAGTTGCTCATGTGACGTCGTTGGAACCACACTCCAGTTGTTGAAGAAGCATATTCTTAAGCA	1040
CAAGGGTGAATACTTTGATATCCAGGAATTGTTCTTTAGATTATACCGTTGATTCCGGCCACGGAGTTCTTATTTGGTGAGT	1120
CCGTGCACTCCTTAAGGACGAATCTATTGGTATCAACCAAGACGATATAGATTTTGCTGGTAGAAAGGACTTTGCTGAG	1200
TCGTTCAACAAAGCCCAGGAATACTTGCTATTAGAACCTTGGTGACAGCTTCTACTGGTTGGTCAACAACAAGGAGTT	1280
TAGAGACTGTACCAAGCTGGTGACAAGTTCAACCACTACTATGTTCAAGAAAGCTTTGGATGCTAGCCAGAAGAGCTTG	1360
AAAAGCAAAGTGGGTATGTGTTCTTGTACGAGCTTGTCAAGCAGACAAGAGACCCCAATGTGTTGCGTGACCAGTCTTTG	1440
AACATCTTGTTGGCCGAAGAGACACCACTGCTGGGTTGTGTGCTTTGCTGTCTTTGAGTTGGCCAGACACCCAGAGAT	1520
CTGGGCCAAGTTGAGAGAGGAAATTGAACAACAGTTTGGTCTTGGAAGACTCTCGTGTGAAGAGATTACCTTTGAGA	1600
GCTTGAAGAGATGTGAGTACTTGAAGCGTTCCTTAATGAAACCTTGGGTATTACCCAAGTGTCCTCAAGAACTTCAGA	1680
ATCGCCACCAAGAACACGACATTGCCAAGGGGCGGTGGTTGACACGCTACCTCGCCAATCTTGATCCAAAAGGGAGAAGC	1760
TGTGTCGTATGGTATCAACTCTACTCATTGACCTGTCTATTACGGCCCTGATGCTGCTGAGTTCAGACCAGAGAGAT	1840
GGTTTGAGCCATCAACCAAAAAGCTCGGCTGGGCTTACTTGCCATTCAACGGTGGTCCAAGAATCTGTTTGGGTGAGCAG	1920
TTTGCCCTTGACGGAAGCTGGCTATGTGTTGGTTAGATTGGTGCAAGATTCTCCACGTTAGGCTGGACCCAGACGAGGT	2000
GTACCCGCCAAAGAGGTTGACCAACTTGACCATGTGTTTGAGGATGGTGCTATTGTCAAGTTTGACTAGCGGCGTGGTG	2080
AATGCGTTTGATTTGTAGTTTCTGTTTGAGTAATGAGATAACTATTGAGATAAGGCGAGTGGATGTACGTTTGTAAAG	2160
AGTTTCTTACAACCTTGGTGGGGTGTGTGAGGTTGAGGTTGCATCTTGGGGAGATTACACCTTTTGCAGCTCTCCGTAT	2240

FIGURE 5 (CONT'D)

ACACTTGTACTCTTTGTAACCTCTATCAATCATGTGGGGGGGGGGTTTCATTGTTTGGCCATGGTGGTGCATGTTAAATC	2320
CGCCAACTACCCAATCTCACATGAACTCAAGCACACTAAAAAAAAAAGATGTTGGGGGAAAAC TTTGGTTTCCCTTC	2400
TTAGTAATTAAACACTCTCACTCTCACTCTCACTCTCTCCACTCAGACAAACCAACCACCTGGGCTGCAGACAACCAGAA	2480
AAAAAAAAAGAACAAATCCAGATAGAAAAACAAAGGCTGGACAACCATAAATAAACAACTCTAGGGTCTACTCCATCTTCC	2560
ACTGTTTCTTCTTCTTCAGACTTAGCTAACAAACAÀCTCACTTCACCATTGGATTACGCAGGCATCACGCGTGGCTCCATC	2640
AGAGGCGAGGCC	2650

FIGURE 6

ppox-NCP1B

Sequence Range: 1 to 3073

POX4 promoter sequence underlined

<u>TATTTCCGGGAGAAATATCGTTGGGGTAAAACAACAGAGAGAGAGAGGGAGAGATGGTTCTGGTAGAATTATAATCTGGTT</u>	80
<u>GTTGCAAATGCTACTGATCGACTCTGGCAATGTCGTAGCTCGCTAGTTGTATGCAACTTAGGTGTTATGCATACACACG</u>	160
<u>GTTATTCGGTTGAATTGTGGAGTAAAAATTGTCTGAGTTGTGTCTTAGCTACTGGCTGGCCCCCGGAAAGATAATCAA</u>	240
<u>AATTACACTTGTGAATTTTGCACACACACCGATTAACTTTCCCTTTTTTGTCCACCGATACACGCTTGCCCTCTTCTT</u>	320
<u>TTTTTCTCTGTGCTTCCCCCTCTGTGACTTTTTTCCACCATTGATATAAAATCAACTCCATTCCCTAAATCTCCCCAG</u>	400
<u>ATTCTAAAACAACTTCTTCTCTTCTGCTTTTTCTTTTTTTTGTATATTTATTTACCATCCCTTTTTTTGAATAGTT</u>	480
<u>ATTCCCCACTAACATTGTTCAAATCTTCACGACATAATGGCTTAGACAAGTTAGATTGTATGTATCATATAACATTGGT</u>	560
GGTCGCTGTGGCCGCTATTTTGCTAAGAACCAGTTCCTTGATCAGCCCCAGGACACCGGTTCTCAACACGGACAGCG	640
GAAGCAACTCCAGAGACGTCTTGCTGACATTGAAGAAGAATAATAAAAAACAGTTGTGTGTTTGGGTCCCAGACCGGT	720
ACGGCAGAAGATTACGCCAACAAATTGTCAAGAGAATTGCACTCCAGATTTGGCTTGAAAACCATGGTTGCAGATTTGCG	800
TGATTACGATTGGGATAACTTCGGAGATATCACCGAAGATATCTTGGTGTTTTTCATCGTTGCCACCTACGGTGAGGGTG	880
AACCTACCGACAATGCCGACGAGTTCCACACCTGGTTGACTGAAGAAGCTGACACTTTGAGTACTTTGAGATATACCGTG	960
TTCCGGTTGGGTAACCTCCACCTACGAGTTCTTCAATGCTATTGGTAGAAAGTTTGACAGATTGTTGAGTGAGAAAGTG	1040
TGACAGATTGCTGAATATGCTGAAGGTGACGACGGCACTGGCACCTTGACGAAGATTTCATGGCCTGGAAGGATAATG	1120
TCTTTGACGCCTTGAAGAATGACTTGAACCTTGAAGAAAAGGAATTGAAGTACGAACCAACGTAAGTTGACTGAGAGA	1200
GATGACTTGTCTGCTGCCGACTCCCAAGTTTCTTGGGTGAGCCAAACAAGAAGTACATCAACTCCGAGGGCATCGACTT	1280
GACCAAGGGTCCATTGACCACACCCACCCATACTTGGCCAGGATCACCGAGACCAGAGATTGTTTCAGCTCCAAGGAAA	1360
GACACTGTATTACGTTGAATTTGACATTTCTGAATCGAACTTGAATAACACCACCGGTGACCATCTAGCCATCTGGCCA	1440
TCCAACCTCCGACGAAAACATCAAGCAATTTGCAAGTGTTTCGGATTGGAAGATAAACTCGACACTGTTATTGAATTGAA	1520
GGCATTGGACTCCACTTACACCATTCATTTCCCAACTCCAATTACTTACGGTGCTGTATTAGACACCATTTAGAAATCT	1600
CCGGTCCAGTCTCGAGACAATTCTTTTGTGCGATTGCTGGGTTTGCTCCTGATGAAGAAACAAGAAGACTTTACCAGA	1680
CTTGGTGGTGACAAACAAGAATTGCGCACCAAGGTTACCCGAGAAAGTTCAACATTGCCGATGCCTTGTTATATTCCTC	1760
CAACAACACTCCATGGTCCGATGTTCTTTTGTGAGTTCTTATTGAAAACATCCAACACTTGACTCCACGTTACTACTCCA	1840
TTTCTTCTTCGTCGTTGAGTGAAAAACAACCTCATCAATGTTACTGCACTCGTTGAGGCCGAAAGAAGCCGATGGCAGA	1920
CCAGTCACTGGTGTGTTTACCAACTTGTGAAGAACATTGAAATTGCGCAAAACAAGACTGGCGAAAAGCCACTTGTTCA	2000
CTACGATTGAGCGGCCCAAGAGGCAAGTTCAACAAGTTCAAGTTGCCAGTGACGTGAGAAGATCCAACTTTAAGTTGC	2080
CAAAGAATCCACCACCCAGTTATCTTGATTGGTCCAGTACTGGTGTGCCCCATTGAGAGGTTTCGTTAGAGAAAGA	2160
GTTCAACAAGTCAAGAATGGTGTCAATGTTGGCAAGACTTTGTTGTTTTATGGTTGCAGAAACTCCAACGAGGACTTTTT	2240

FIGURE 6 (CONT'D)

GTACAAGCAAGAATGGGCCGAGTACGCTTCTGTTTTGGGTGAAAACCTTGAGATGTTCAATGCCTTCTCTAGACAAGACC	2320
CATCCAAGAAGGTTTACGTCCAGGATAAGATTTTAGAAAACAGCCAACCTTGTGCACGAATTGTTGACCGAAGGTGCCATT	2400
ATCTACGTCTGTGGTGACGCCAGTAGAATGGCCAGAGACGTCCAGACCACGATCTCCAAGATTGTTGCCAAAAGCAGAGA	2480
AATCAGTGAAGACAAGGCCGCTGAATTGGTCAAGTCCTGGAAAGTCCAAAATAGATACCAAGAAGATGTTTGGTAGACTC	2560
AAACGAATCTCTCTTTCTCCCAACGCATTTATGAATATTCTCATTGAAGTTTTACATATGTTCTATATTTTCATTTTTTTT	2640
TTATTATATTACGAAACATAGGTCAACTATATATACTTGATTAAATGTTATAGAAACAATAATTATTATCTACTCGTCTA	2720
CTTCTTTGGCATTGGCATTGGCATTGGCATTGGCATTGCCGTTGCCGTTGGTAATGCCGGGATATTTAGTACAGTATCTC	2800
CAATCCGGATTTGAGCTATTGTAAATCAGCTGCAAGTCATTCTCCACCTTCAACCAGTACTTATACTTCATCTTTGACTT	2880
CAAGTCCAAGTCATAAATATTACAAGTTAGCAAGAACTTCTGGCCATCCACAATATAGACGTTATTCACGTTATTATGCG	2960
ACGTATGGATATGGTTATCCTTATTGAACTTCTCAAACCTTCAAAAACAACCCACGTCCCGCAACGTCATTATCAACGAC	3040
AAGTTCTGACTCACGTCGTCGGAGCTCGTCAAG	3070

FIGURE 7

Strain Comparison (7-25-01)

Reductase Assays

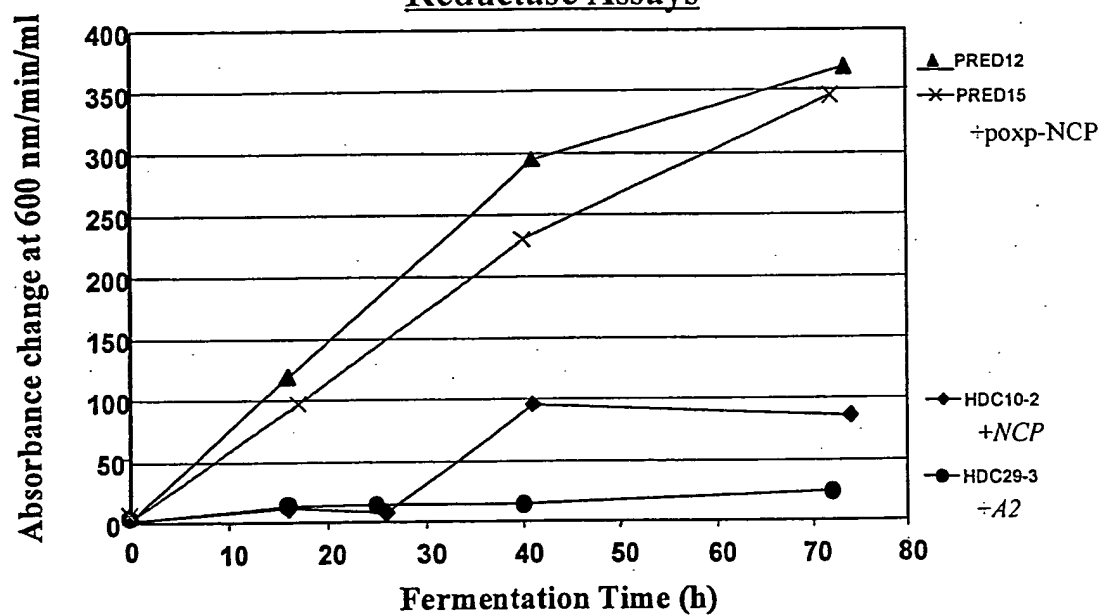
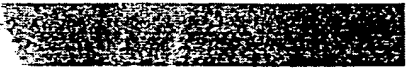




FIGURE 8

Strain	Modification	Western blot
H5343	-	
HDC10-2	<i>NCP1B</i>	
PR 12	Pox_ NCP1B*	

Western blot using reductase specific antibody: Significantly more reductase induced in the pox-gene fusion strain during fermentation.

FIGURE 9

